

[20th January 1930]

APPENDIX I.

[Vide answer to question No. 1044 asked by Mr. P. Siva Rao at the meeting of the Legislative Council held on the 20th January 1930, page 26 supra.]

**Proceedings of the Board of Revenue (Land Revenue and Settlement),
Mis. No. 2392, dated 12th August 1929.**

C. W. E. COTTON, Esq., C.I.E., I.C.S.,

Commissioner of Land Revenue and Settlement.

Copies of Board's Reference No. H. 170/28-2, dated 15th March 1928, and of the replies of the Collectors of Kistna, Guntur, Bellary, Anantapur, Cuddapah and Kurnool and of the Director of Agriculture will be submitted to Government.

2. The districts affected by the modified Tungabhadra project are Kistna, Guntur and the Ceded districts.

Kistna district may be left out of consideration. There is little scope for extension of irrigation under first crop as a result of the Tungabhadra scheme, since the bulk of the irrigable lands in the district are to be brought under a short-crop scheme or other schemes for the extension of delta canals. The Collector states also that there is no incentive to ryots to grow a second crop. They prefer to raise a long crop and to sow sunnhemp or green or blackgram just before the harvest of the first crop so as to take advantage of the moisture in the soil to establish the seedlings. In this way they secure a second crop with little additional labour or cost. Therefore it is unlikely that they will take to growing a shorter period first crop so as to be able to raise a second wet crop even if water is provided in the second-crop season.

In Guntur district there are about 7.8 lakhs of acres available for cultivation. Though the ryots are stated to follow antiquated methods of cultivation, the Collector expects to find them eager to take advantage of water at reasonable rates of water-cess and apprehends no difficulty in regard to manure.

In the Ceded districts however the position is different. There are large areas available for irrigated cultivation (Kurnool 2.9 lakhs acres, Bellary 11.9 lakhs acres, Anantapur 7.6 lakhs acres and Cuddapah 1.9 lakhs acres), but about half the above is black cotton soil the cultivators of which are unlikely to take to wet cultivation. It is reported that they would prefer to raise groundnut or other profitable commercial crop instead of paddy or other wet crop which

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would involve more trouble and expenditure. In Anantapur district, for example, the Collector expects that only a fifth of the areas will take water. Labour should be adequate generally; some difficulty is apprehended as regards manure. The ryots depend chiefly at present on green manure, but agricultural department is popularizing the use of fertilizers and by the time the scheme functions the problem may perhaps be less difficult. As regards second crop the Collectors of Kurnool and Cuddapah state that if there are adequate supplies of water in the canals up to the end of April there should be a considerable extension of second-crop cultivation. The Collector of Anantapur estimates the area that might come under second crop at one-sixth of the first-crop extent and the Collector of Bellary at one-third.

It appears that generally the ryots will be willing to pay any reasonable rate of water-cess up to Rs. 10 per acre.

As regards the conversion of black cotton dry lands into irrigated wet, the Ceded Districts Irrigation Committee was of opinion that if water was provided for two crops there would be less difficulty in persuading the ryots to take advantage of the supply. The Director of Agriculture's view is that the adaptation of black cotton soils to paddy cultivation is to be deprecated and that if water is available they should preferably be converted into garden lands. The Board concurs in this view.

3. The Board has attempted to make a very rough estimate of the revenue possibilities on the basis of the Collectors' reports. It has assumed that the full area available for irrigated cultivation in Guntur district and in the red soil taluks of the Ceded districts will take water at Rs. 10 for the first crop, that about a third of this first-crop area would take water for second crop at the same rate of Rs. 10 per acre and that about a fourth of the black soil tract will raise irrigated dry crops on an average. On these assumptions the revenue realizable should be about 235 lakhs as shown below:—

	RS. LAKHS.
I Crop on 17 lakhs acres at Rs. 10 an acre (Guntur 7 lakhs acres, Bellary 5 lakhs acres of red soil, Kurnool, Cuddapah and Anantapur 5 lakhs acres of red soil)	170
II Crop on 5 lakhs acres at Rs. 10 an acre (a third of the first-crop area rounded to the lowest lakh) ..	50
One irrigated dry crop on 3 lakhs acres of black soil lands in the Ceded districts (Bellary 1.5 lakhs acres; other districts 1.5 lakhs acres)	15
Total ayacut 20 lakhs acres. Total revenue ..	<u>235</u>

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For the purpose of the above figures the available dry area is rounded to the lowest lakh as allowances have to be made for channels, roads, house-sites, unprofitable areas, etc.

4. This revenue of 235 lakhs will justify a capital outlay of about 51 crores assuming that in the case of a project fully protective in conception, the Government will be content with a return of 4 per cent.

						LAKHS.
Gross revenue						235
Deduct—Maintenance charges on 20 lakhs						LAKHS.
acres						20
Collection charges						12
						—
						32
Net revenue						203

The capital outlay which will give a net revenue of Rs. 203 lakhs at 4 per cent is Rs. 5,075 lakhs or 51 crores in round figures.

5. The cost of the old Tungabhadra scheme for irrigating 9.6 lakhs acres of dry crop was estimated at 13 crores in 1922. Even allowing for some increase in prices since 1922 and also for the greater magnitude of the present scheme which is a combination of several earlier schemes, the cost is unlikely to exceed 50 crores. It is needless to emphasize that the above calculations are very rough and may require substantial modification when further data are available. It should not be forgotten in estimating probable expenditure that the scheme must provide supplies of water for about one and a half times the area for which the old Tungabhadra scheme was designed, if the full area on which estimates of revenue are based is to be irrigated.

(True extract)

B. G. HOLDSWORTH,
Secretary.

To the Secretary to Government, Public Works Department (Irrigation).

ENCLOSURES

(1)

*Reference from the Board of Revenue (Land Revenue and Settlement),
No. H. 170/28-2, dated 15th March 1928.*

[Irrigation—Tungabhadra project—Preliminary revenue investigation.]

Government desire that a general investigation should be made now of the probable demand for irrigation (especially for second crop) in the areas coming under a modified Tungabhadra project. The general idea of the project as now contemplated includes the irrigation of—

(1) Areas in the Hadagalli, Hospet and Rayadrug taluks in the Bellary district.

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(2) Areas in the Gooty, Anantapur and Dharmavaram taluks, the last two by means of a branch canal taken across the Penner.

(3) Areas irrigable by the proposed Upper Penner (Tadpatri) canal system.

(4) Areas irrigable by a widened Kurnool-Cuddapah canal and the Velgode project, the latter being extended to Badvel and Siddhavattam taluks in the Cuddapah district.

(5) Areas irrigable by the Owk project and canal from the Kunderu via Nossam to Jammalamadugu.

(6) Area irrigable by a diversion dam across the Kistna at Pulichintala, and canal system in the Guntur district (Colonel Ellis' old Kistna Reservoir Project).

(7) Kistna delta extensions and second crop in the delta.

The investigation of the project on the engineering side has not advanced far enough to enable a regular revenue forecast to be prepared at present. The Collectors are however requested to make a general investigation now and submit a preliminary report in the matter. The report should deal with the following points among others:—

- (1) the area available and fit for cultivation ;
- (2) the present extents of wet and dry lands in the above areas ;
- (3) the present agricultural practices in the tract ;
- (4) labour supply, population and availability of manure ;
- (5) the general probability of cultivators taking full advantage of water ; and

(6) a reasonable rate of water-cess taking into consideration the fact that the project will be costly.

2. The Director of Agriculture is requested to arrange for a careful investigation of the suitability of the soil in the tract for irrigated cultivation and report the result to the Board.

B. G. HOLDSWORTH,
Secretary.

To the Collectors of Bellary, Anantapur, Cuddapah, Kurnool, Guntur and Kistna.
„ Director of Agriculture.

(2)

Letter from J. A. BYERS, Esq., M.A., I.C.S., Collector of Guntur,
No. D. Dis. 3650/28, dated 27th June 1928.

Irrigation—Tungabhadra Project.—For purposes of preliminary investigation and report it is assumed that the project now contemplated is more or less similar to the one proposed and described in paragraph 13 of the report of Colonel Ellis, Superintending Engineer on special duty in 1911, for the investigation of the Kistna reservoir project.

The present project is therefore likely to affect the villages of the taluks—Sattenapalle taluk, Guntur taluk, Narasaraopet taluk, Bapatla taluk, Ongole taluk and Tenali taluk—as detailed in pages 315 to 323 of Volume I of Colonel Ellis' report on Kistna reservoir project.

2. (a) A statement showing (i) the area available and fit for cultivation, (ii) present extents of wet and dry lands and (iii) population, in these areas is enclosed.

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(b) *Present agricultural practices in this area.*—The antiquated country plough is still in use. The progress made by the ryot population in the adoption of the improved methods of agriculture advocated by the Agricultural Department is very slow.

(c) *Labour supply.*—Labour supply is sufficient for local requirements at present. If the project should materialize, the labouring classes now migrating to the deltaic tracts during the wet cultivation season, may not go there in future, and this may result in some want being felt in some parts of the district just in the beginning after the completion of the scheme till the conditions in the district get settled.


(d) *Availability of manure.*—Cattle manure and pati earth are available for the present requirements. Any deficiency in their supply will be made up by the artificial manure prepared by Messrs. Parry & Company which the cultivators are at present slow to take advantage of. Besides, oil-cake and nitrates are being freely used now. With an extensive use of these, and the usual supply of cattle manure, there may not be any want of manure felt in the district.

(e) *Probability of taking full advantage of water.*—Except in the villages of Tenali taluk and some villages of Bapatla and Guntur taluks, there is at present no irrigation from the Kistna canal water in the taluks referred to above. Almost the whole of the cultivable extent in the upland area is used for the cultivation of dry crops which mainly depend on timely rains. The cultivators in these upland tracts do not always anticipate a good crop every year in spite of the expense, labour and continuous attention involved in the cultivation of dry crops. Further the supply of water in the Kistna river is limited and in consequence water cannot be made available at all at present for the cultivation of a second wet crop in Guntur district. The ryots of both the upland and deltaic tracts will therefore be eager to take full advantage of the supply of water.

(f) *Reasonable rate of water-cess taking into consideration the fact that the project will be costly.*—The ryot population do not mind paying a water-rate at a reasonable scale fixed by Government, for a wet crop which a ryot is certain to harvest with advantage. It is not now possible to fix the water-rate under the project when the alignment of the irrigation channel and the cost of the project are not known. However, the lands commanded by the project may be classed as 'upland dry' and be charged at the rate prescribed in Appendix D to Board's Standing Order No. 4, Volume II (page 10) as a minimum but probably more to provide for an economic return on the capital to be sunk on the project.

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Sub-Enclosure
Guntur District.

Serial number.	(1)	Name of the taluk and village.	(2)	The present extents of wet and dry land.		(3)	The present agricultural practice in the tract.		(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				Wet.	Dry.	Area available and fit for cultivation.						Labour supply.	Population	Availability of manure.	General probability of cultivation taking full advantage of water.	Reasonable water-rate taking into consideration the fact that the project will be costly.
1		Ongole taluk	..	708.88	106,398.14	107,407.01	 <p>The lands are ploughed up with country plough. Improved methods of agriculture are not followed to any appreciable extent.</p>					Sufficient at present.	94,301	Cattle manure and patti earth available at present.	Full advantage of water will be taken by the cultivators provided there is sufficient supply of water available for second-crop wet cultivation also.	Full advantage of water will be taken by the cultivators provided there is sufficient supply of water available for second-crop wet cultivation also.
2		Bapatla taluk	..	27,419.97	158,614.17	186,034.14							130,216			
3		Tenali taluk	..	257.44	6,995.89	7,253.33							15,454			
4		Guntur taluk	..	5,616.02	282,115.07	287,731.09							271,426			
5		Sattenapalle taluk	..	528.56	121,713.70	122,242.26							93,856			
6		Narasaraopet taluk.	..	379.20	70,170.26	70,549.46							108,750			
		Total ..		24,910.02	746,307.22	781,217.29							714,003			

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4. This revenue of 235 lakhs will justify a capital outlay of about 51 crores assuming that in the case of a project fully protective in conception, the Government will be content with a return of 4 per cent.

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5. The cost of the old Tungabhadra scheme for irrigating 9.6 lakhs acres of dry crop was estimated at 13 crores in 1922. Even allowing for some increase in prices since 1922 and also for the greater magnitude of the present scheme which is a combination of several earlier schemes, the cost is unlikely to exceed 50 crores. It is needless to emphasize that the above calculations are very rough and may require substantial modification when further data are available. It should not be forgotten in estimating probable expenditure that the scheme must provide supplies of water for about one and a half times the area for which the old Tungabhadra scheme was designed, if the full area on which estimates of revenue are based is to be irrigated.

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(1) Areas in the Hadagalli, Hospet and Rayadrug taluks in the Bellary district.

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Korra is largely grown in Badvel taluk and accounts for 18 per cent of the area cultivated in the taluk. In Cuddapah and Proddatur taluks, paddy is grown on large areas chiefly under the Kurnool-Cuddapah canal and the tanks fed by it. In Jammalamadugu taluk, the percentage of paddy is much less.

Of the industrial crops, viz., cotton, indigo, castor, groundnut, tobacco, turmeric, etc., groundnut has taken the lead in recent years. Indigo, cotton and turmeric are not extensively grown for want of demand in the foreign markets. Castor has lost its use and is rarely grown except in Rayachoti taluk. Gingelly is grown on some extent as second crop.

The harvests of crops sown early are over by the middle of January and those of late sown crops by the end of March.

4. *Labour supply, population and availability of manure.*—The district is poor on the whole. In Cuddapah and Proddatur taluks, the labour supply is generally sufficient. It is plentiful in Badvel and Siddhavattam taluks. It is generally dear in Jammalamadugu taluk. But in the harvest season, large numbers of labourers flood all the taluks of this district from the adjoining taluks of Anantapur and Nellore districts as the wages given in the harvests here are generally high and attractive.

According to the census of 1921, the population was 887,929 a decrease of 0·7 per cent as compared with the figures for 1911. The population averaged 150 per square mile varying from 101 in Siddhavattam to 223 in Proddatur taluk. The percentage of people residing in towns is 10. The population per square mile of total area of the taluks affected by the project is given below :—

Badvel ..	..	120	Jammalamadugu ..	261
Proddatur ..	..	223	Kamalapuram ..	215
Siddhavattam ..	..	101	Cuddapah ..	201

The chief manures locally available are cattle dung, oil-cake, green and dead leaf. Recently in areas sown with paddy under the Kurnool-Cuddapah canal in Proddatur and Cuddapah taluks, the agricultural demonstrators are popularizing the use of chemical manures. There is no doubt that the manure that is locally available is not sufficient to meet the requirements of the ryots.

5. *The general probability of the ryots taking full advantage of the water.*—In normal seasons, the ryots of Proddatur and Jammalamadugu taluks find it more profitable to raise dry crops, both food and industrial and only a limited area is raised with wet crops and irrigated. In the areas commanded by the Kurnool-Cuddapah canal in Proddatur and Cuddapah taluks extension of irrigation is possible and can be expected. In Badvel and Siddhavattam taluks, the ryots are eager to take full advantage of the water. In Jammalamadugu taluk, however, the ryots are easy-going and the area that will be commanded by the Owk project is light black-cotton soil and how far the ryots will take full advantage of water cannot be answered until the alignment is definitely known.

If the supply is assured in March, there will be an extensive second crop cultivation all through. Otherwise, there will be very little of second crop cultivation.

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6. *A reasonable rate of water-cess taking into consideration the fact that the project will be costly.*—The water-cess now charged for the lands irrigated by the Kurnool-Cuddapah canal is based upon the differential water-rate system. The Kurnool-Cuddapah canal being a first-class source, the highest and lowest wet rates are Rs. 10 and Rs. 3, respectively. This system is recommended for adoption for the project under contemplation.

The Tahsildars of Badvel and Siddavattam, however, report that the ryots of those taluks would pay a maximum wet rate of Rs. 10 and Rs. 8 an acre respectively. These rates are high enough.

(4)

Letter from D. H. BOULTON, Esq., I.C.S., Collector of Kistna,
D. Dis. No. 2181/28, dated 3rd September 1928.

[Irrigation—Tungabhadra Project—Preliminary—Investigation.]

This district covers only the eastern portion of the Kistna delta and my report is confined to it.

2. The several points on which information has been called for by the Board are dealt with below seriatim :

(i) *Area available and fit for cultivation.*—The extent under this head in the delta is 585,313 acres. It excludes the upland and dry portions of the district and the area covered by the Divi project, which are not commanded by the anicut system.

(ii) The present extents of wet and dry lands in the above area are —

							ACS.
Wet	..	..	..	..	..	..	373,726
Dry	..	..	..	..	..	..	186,872

The difference of 23,715 acres represents waste.

(iii) *The present agricultural practices in the tract.*—The agricultural practices in a district are closely dependent upon the monsoon conditions. In this district the south-west monsoon prevails from June to September and at the same period the Kistna river will be in floods, with the result that agricultural operations are always in full swing during that period.

The sowing of seed beds begins late in May and early in June with the opening of the canals, and transplantation extends into the month of August, being entirely over by the end of that month for all registered wet lands. The virtual non-existence of storage tanks or other facilities by which the ryots can grow seedlings sufficiently early so as to commence transplantation as soon as the delta canals open is a handicap to agricultural operations, and extends the season unduly. The staple product of the delta is wet paddy (two or three varieties) which stand on the ground for five to six months ending with December. The practice is that after the crops are cut, they are left to dry by heaping them in the field for a month or two before they are thrashed. The Kistna canals are closed from March to June, while the supply in them from January onwards will be too inadequate to grow a second crop. The want of grazing grounds in the delta tract is another reason why the ryot grows a fodder crop in preference to a second wet crop.

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(iv) *Labour supply—Population and availability of manure*—(a) *Labour supply*.—Labour is always available in this delta and its scarcity has never been felt. The local depressed classes as well as other lower classes supply the ordinary daily labour. In times of transplantation and harvest labour is however imported from the upland taluks of Guntur and Kurnool to supplement the local labour.

(b) *Population*.—The population of the area in the delta tract is on the increase and it was 609,775 as per the census of 1921.

(c) *Manures*.—The favourite manure for the ryot is pati earth which is now becoming scarce. It is applied to the land once in five to ten years and its effect on the land continues for an equal period. Next in importance is the farm-yard manure, which is less costly and the most readily available, although unfortunately a very large amount of this is lost to agriculture through the custom of using it for domestic fuel in the delta, where firewood is very dear. Manure is also supplied by penning sheep in the fields and also by raising green manure crops in recent years. Artificial manures have not yet become popular for the reason that the cost is prohibitive and the effects are supposed not to be lasting.

(v) *The general probability of cultivators taking full advantage of water*.—The delta ryot knows full well the intrinsic value of water for irrigation. No better illustration of this can be adduced than the rapid extension of irrigation in the delta during the last decade. The ryot has also realized that a wet crop is more profitable and assured than a dry crop which depends for its growth entirely upon the vicissitudes of the season. Notwithstanding this, the scope for extension of irrigation in the first-crop season in the delta portion of the district is as a result of any Tungabhadra project, very limited, that considerable further extension of ayacut as a result of the installation of the 6 feet shutters at the Bezwada anicut is now being proposed. If these proposals are given full effect to there will be little further available land in the delta to benefit from any extra water that may be brought into the Kistna as a result of the Tungabhadra project. The area that the present delta conditions could command is 497,800 acres and the Executive Engineer, Kistna Eastern division, is of opinion that the remaining area available and fit for wet cultivation can also be supplied with water for growing a short crop. There is thus little likelihood of extension of irrigation in the delta during the first-crop season, as a result of the proposed Tungabhadra project.

3. There thus remains the question of possibility of growing a second crop.

There is no regular second-crop wet cultivation in the district worth the name. There are only about half a dozen villages in the Bandar taluk under the Bantumilli canal bordering the West Godavari district where a second crop is tried after the first crop, which is a shorter one than elsewhere in the delta and stands on the ground for four months only, being harvested before the end of November. Nowhere else in the delta is the second crop raised. The possibilities of a second crop will arise only if adequate supply is secured in the canals till the end of April, and if the ryot gives up his traditional beliefs and grows another variety of wet crop which remains on the ground for a shorter period in the first crop season.

The ryot generally sows in rich soils either sun-hemp (fodder crop), the mainstay of delta cattle, which are stall fed, or either green or black gram just before the harvest with the help of the moisture of the first crop. This

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involves no additional labour or cost to the ryot as in the case of a second wet crop, the difference in the net profits in the two cases not being much. There is thus little incentive for the ryots in the above tracts to have recourse to second crop.

As regards the possibility of raising second paddy crop in inferior soils which are not fit for fodder crop, the reports of my subordinate officers show that the possibilities for growing a second wet crop are limited because of the poor nature of the soil, not to speak of the absence of sufficient interval between the two crops. If the ryot thinks it worth while to raise a second crop at all, it can only be in the short crop area referred to in paragraph 2. No estimate of area under second crop can however under the circumstances be made with any degree of accuracy.

4. *A reasonable rate of water-cess taking into consideration the fact that the project will be costly.*—The resettlement enhancement in the assessment of the delta ayan wet lands is 3 annas in the rupee, while the proposed water-rate in the case of zamin and inam lands is Rs. 6-4-0 per acre under first-class source both for the first and second crops. The Tungabhadra project cannot bestow any additional advantage to the first wet crop and therefore the question of charging a higher rate of assessment in consequence hardly arises. As it is not clear whether any Tungabhadra project is going to make possible a second crop in the delta, it seems premature to report on the possibility of charging any water-rate on such a second crop. I feel at least very doubtful in view of the existing practices in the delta whether the ryot would ever agree to take extra water for second wet crop if this entailed paying any additional water-rate, over and above the half the first crop charge ordinarily levied for a second crop in Government villages.

Finally I may add that for lack of any details of how this Tungabhadra project is proposed to benefit this district I have found it very difficult to submit a definite report.

Fixing of the ayacut in the Kistna Eastern Delta.

430,000 was fixed in October 1924.

300 added for the assignment of sepoy's in March 1926.

11,000 included in the ayacut in the Collair zone in August 1926.

4,000 proposed extension consequent on the installation of the 6 feet shutters in August 1928.

4,500 short crop area—Vempad project.

35,000 short crop area under the East Bank Canal extension and Kanakalamadugu.

13,000 lands to be irrigated with conditional permission.

497,800

(5)

Letter from P. RAMALINGAM, Esq., I.C.S., Collector of Kurnool, dated 30th September 1928, D. Dis. No. 871/28.

[Irrigation—Tungabhadra project—Preliminary revenue investigation—Report submitted.]

From the Board's reference it would appear that, so far as this district is concerned, the project as now contemplated will command the areas

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irrigable by (1) a widened Kurnool Cuddapah Canal and the Velgode project, the latter being extended to Badvel and Siddhout taluks of the Cuddapah district and (2) the Owk project and canal from the Kunderu via Nossam to Jammalamadugu. If so, the modified project will serve the taluks of (1) Kurnool, (2) Nandikotkur, (3) Nandyal, (4) Sirvel and (5) Koilkuntla. The taluks of Dhone and Pattikonda corresponding to a portion of the old taluk of Ramallakota and of Pattikonda, which may be called the famine zone of this district and which were intended to be served by the original Tungabhadra project are left out of the scope of the present modified project. To that extent, therefore, the value of the modified Tungabhadra project suffers as a protective work for this district. My remarks below apply only to the five taluks mentioned above.

2. *Area available and fit for cultivation, etc.*—A statement showing the area available and fit for cultivation and the present extents of wet and dry lands in the above areas is enclosed.

3. *The present agricultural practices.*—Though the ryots of the above five taluks generally know how to raise wet crops, yet after the advent of the groundnut crop they are paying increasing attention on its growth on a vast scale since it fetches large profits with a comparatively small outlay of labour and expenditure. They usually cultivate commercial crops such as cotton and groundnut and food crops such as cholam, korra and arika all with the aid of the ordinary rainfall. But when the rains fail they seek the help of irrigation sources to irrigate some of these crops and bring them to maturity. In Sirvel taluk it is only on a comparatively small extent that paddy and other wet crops are grown. This is due to the fact that the raising of paddy and other wet crops involves more trouble and expenditure to the ryot, while the return of income is not so attractive as in the case of the dry crops which yield a far higher return. In Koilkuntla taluk, the soil is almost entirely black cotton and does not therefore lend itself to wet cultivation as easily as other sorts of soil. The initial expenditure and labour involved in bringing it under wet cultivation is much greater than in other soils. The ryots are quite wealthy but neither they nor their labourers have the aptitude or the capacity for the steady and sustained effort indispensable for bringing the black cotton soil under wet cultivation in the first instance. They are content to grow dry crops which fetch them large profits with little labour. The chief food crops grown are cholam and korra and the chief industrial crops groundnut and cotton. Other crops are not so successful on this soil. Except for the sowings and for the first two months when the plants are tender, these crops require very little water to mature. They cannot be sown except with the aid of rain; and after they are sown, the retentive capacity of the soil and the winter dew dispense with the necessity for any further wetting. The registered wet extent under the Kurnool-Cuddapah Canal in this taluk is small, though it is capable of irrigating quite a large extent. In most of the villages of the taluk irrigated by the canal large extents are classed as irrigable dry but the ryots do not irrigate their lands, as their soil is fertile and as the dry crops sown on them yield a good return without much attention being paid to them. Any extension of irrigational facilities in this taluk, will not, I am afraid, be taken advantage of by the ryots. In Nandyal taluk the population in the villages commanded by the project is not so great as to supply the necessary labour and to create a greater demand for wet cultivation. In Kurnool and Nandikotkur taluks also the

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ryots utilize canal water only when the crops are $1\frac{1}{2}$ to 2 months old, and that only when the rains are insufficient and the crop has been raised by transplantation.

4. *Labour supply, population and availability of manure.*—This district in general is thinly populated and this is the case throughout the area commanded by the contemplated project. The population is, however, sufficient to cultivate the wet lands that will be commanded by the project in Sirvel, Koilkuntla, Kurnool and Nandikotkur taluks. The population in the villages likely to be affected by the project in the Nandyal taluk as already stated is not sufficient to create a greater demand for wet cultivation than at present. In the Owk division of the Koilkuntla taluk the population is steadily declining owing to the prevalence of a malignant type of malaria. Even the existing wet land does not find effective cultivators in this area and the value of irrigable lands which can command water for two crops under some of the tanks in this area is so low as Rs. 150 per acre. It may, however, be stated that the labour supply in all the taluks is adequate for sowing and weeding operations. During the harvest season a portion of the labour population of adjoining red-soil taluks, where harvest ends earlier, immigrates temporarily for a month or two and thus augments the available supply of labour. Cattle manure is available in sufficient quantities in all the taluks. In Sirvel and Nandikotkur taluks and in the Owk division of the Koilkuntla taluk, owing to the proximity of forests leaf manure is also available in sufficient quantities. In the main division of the Koilkuntla taluk, the lands are of rich black soil and do not require much manuring for dry crops. The penning of a flock of sheep for a week once in about four or five years is all that is needed to recoup the fertility of the lands. In Nandyal taluk, however, sufficient manure is not available and it is besides very costly. In Kurnool taluk generally dung manure is used and is available in sufficient quantities.

5. *General probability of cultivators taking full advantage of water.*—This is a district having generally a scanty rainfall. The cultivators turn to the irrigation sources only when they find the rainfall inadequate. The bulk of the area irrigated by the Kurnool-Cuddapah canal consists of black cotton soil. Though in years of drought the Kurnool-Cuddapah canal brings in good revenue, in years of good rainfall it must be considered a failure from the financial point of view. The chief reasons for not irrigating a fair proportion of the area under the Kurnool-Cuddapah canal in all seasons are the following. In the first place the tract through which the Kurnool-Cuddapah canal runs is sparsely populated; secondly, the dry holdings of the ryots are large and the ryots get an ample income by the cultivation of dry crops; thirdly, the lands commanded by the canal are heavy black soils which are well adapted for dry crops, and yield a better return with dry than with wet crops; fourthly, the average ryot of this district is lazy, conservative and easily contented and will not apply the labour required for bringing the black soils under wet cultivation. Even in a bad year the ryots take water from the canal only at the last moment. Added to these, the high water-rate of Rs. 9 per acre also acts as a deterrent in the way of the ryots taking full advantage of the canal water. All these difficulties exist in the tract commanded by the modified Tungabhadra project in this district; and it will have to be undertaken more as a protective work than as a financially profitable scheme. It must, however, be conceded that, if there is sufficient supply of water for irrigation from the contemplated project, the ryots of Kurnool and Nandikotkur taluks are likely to take full advantage of the water to increase their second-crop cultivation.

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6. *Rate of water-cess.*—The highest wet rate in Sirvel taluk is Rs. 8 and that in Koilkuntla taluk Rs. 9. The ryots of the villages commanded by the Velgode project have consented to pay at Rs. 9 and Rs. 10 per acre. And though the ryots of one village of Nandyal taluk (Timmapuram) are prepared to pay at Rs. 12 per acre any rate beyond Rs. 10 will not be welcomed by the ryots, and may be beyond their average capacity. A flat rate of Rs. 10 per acre may, therefore, have to be adopted, though it would be a very low rate in view of the enormous cost of this project.

Statement showing the area available and fit for cultivation, etc.,
under the Tungabhadra project.

Serial number and name of taluk.	Area available and fit for cultivation.	Present extents of wet and dry lands in the area in column 3.	
		Wet.	Dry.
	ACS.	ACS.	ACS.
1. Sirvel ..	132,937.39	4,185.90	117,207.27
2. Nandyal ..	49,295.11	10,928.21	33,186.84
3. Koilkuntla ..	32,152.00	197.65	30,659.31
4. Kurnool ..	5,272.93	1,671.19	3,054.43
5. Nandikotkur ..	72,291.30	4,858.20	67,433.10
Total ..	291,948.73	21,841.15	251,540.95

(6)

From M.R.Ry. Rai Bahadur N. GOPALASWAMI AYYANGAR Avargal,
B.A., B.L., Collector of Anantapur, dated 17th March 1929,
No. Rc. 2063/28-A-5.

[Irrigation—Tungabhadra project—Modified scheme—Preliminary
revenue investigation—Report sent.]

In submitting herewith the report called for in Board's Reference No. H. 170/28-2, dated 15th March 1928, it is necessary to state at the outset that the investigation on which it is based and the estimates given therein have necessarily been of the roughest description. Care has, however, been taken to err rather on the side of the extreme caution than on that of extravagant optimism.

2. When the reference was first received, even these rough investigations were handicapped on account of absolute lack of information especially as regards the portions of the Anantapur and Dharmavaram taluks to which it was proposed to supply Tungabhadra water, but, officers were instructed to make the most probable guesses they could and supply as much information as possible. The receipt in the beginning of January last from the Executive Engineer, Tungabhadra project, of a copy of the Anantapur district map showing a rough alignment of the project canal in the district and indicating the area likely to be commanded by it in the four taluks of Gooty, Tadpatri, Anantapur and Dharmavaram, necessitated the collection of fresh facts and figures. With reference to the colour-washing in this map, the names of the villages likely to be benefited have been made out and information collected in respect of them. The map shows that some of

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the villages on the outskirts of the colour-washed area will only be partially commanded. It is not possible to determine with any approach to accuracy what portion of such villages can be taken as likely to be benefited by the project until levels have been taken and the actual alignment of the village distributaries is known. No attempt has therefore been made to determine what portion of the areas available and fit for cultivation in these villages lies within the zone of the project irrigable area or to ascertain whether and what portions of the present extents of wet and dry cultivation in such villages are included in such zone.

3. A statement is submitted showing—

- (1) the names of the villages commanded,
- (2) the area in each village available and fit for cultivation, and
- (3) the present extents of dry and wet lands in each village.

In respect also of the villages which are shown in the Executive Engineer's map as only partially commanded, the figures furnished in the statement, it should be remembered, represent only the areas available in the entire villages concerned.

4. According to the rough map sent by the Executive Engineer, 217 villages of this district (115 fully and 102 in part) are expected to be commanded by the 'modified' project.

These villages are distributed among the four taluks as follows :—

Taluks.	According to the original irrigation project.	According to the modified project.		
		Entire.	Part.	Total.
1. Gooty	70	29	39	68
2. Tadpatri	27	14	16	30
3. Anantapur .. .. .	..	52	29	81
4. Dharmavaram .. .. .	..	20	18	38

In the taluks of Gooty and Tadpatri there is only a very slight change in the number of villages expected to be benefited under the original scheme.

5. The total extents of the present wet and dry lands and of the extents available and fit for cultivation in project-affected villages of the four taluks are (the figures have been rounded to hundreds of acres) :—

Taluks.	Present extent.			Total probable area of land fit and available for cultivation.
	Wet.	Dry.	Total.	
1. Gooty	ACS. 5,700	ACS. 257,800	ACS. 263,500	ACS. 270,100
2. Tadpatri	5,100	86,100	91,200	93,500
3. Anantapur	12,800	149,400	162,200	227,600
4. Dharmavaram	11,600	89,500	101,100	184,700

In the taluks of Gooty and Tadpatri the area available for cultivation in the villages expected to be commanded by the original project was estimated at 374,763 acres and of this 65,726 acres or 17.5 per cent including the

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existing wet area, was estimated as the extent likely to be brought under irrigation. The probable extent reported at present as fit for cultivation in the areas proposed to be brought under the modified scheme in these taluks is 348,400 acres. The difference comes to nearly 26,000 acres. The figures now reported by tahsildars are obviously not acceptable as they stand as the extent of present wet and dry area reported by them is identical with the probable area available for cultivation. Further information has been called for from the tahsildars and revised figures will be reported in due course. For the purposes of this rough forecast, however, the extent likely to be irrigated in these taluks including the present irrigated lands may be taken at 72,000 acres or about 20 per cent of the total probable cultivable extent.

In Anantapur and Dharmavaram taluks, the soil is mostly red and it is likely that irrigation will be in greater demand here than in the black cotton soils which predominate in the portions of the Gooty and Tadpatri taluks, coming under the scheme. It is therefore reasonable to assume that a larger proportion of the cultivable area will be irrigated in the Anantapur and Dharmavaram taluks. I should have estimated this proportion at something higher than even 25 per cent. But the country in these taluks is undulating, full of ups and downs. The levels are unknown and the village distributaries have not been aligned. There is also the fact that while out of 119 villages in these two taluks as many as 47 are shown to be only partially commanded, our figures for the cultivable area in these 47 refer to the entire villages. It seems therefore safe for the present to assume that only 20 per cent of the extent reported as available for cultivation will be brought under irrigated cultivation. This gives an estimated extent of 82,600 acres in these two taluks (45,600 in Anantapur and 37,000 in Dharmavaram). One lakh fifty-four thousand and six hundred acres may therefore be roughly estimated as likely to take project water in all the four taluks of this district.

6. As regards second crop, there will certainly be a regular and steady demand for water. Even now, under the precarious sources and under the river channels and wells, ryots generally take to the cultivation of second irrigated crops to the fullest extent possible. As the project will provide an assured supply, the ryots will not fail to put forth a substantial demand for second crop irrigation. Irrigation of the kind which the Tungabhadra project will give is practically unknown in a district like this and it is difficult to estimate the likely demand for second crop irrigation based on any practical local experience. The estimate of one-sixth is safe for all practical purposes and may be adopted. The area of likely second crop irrigation may therefore be taken as 25,500 acres including both dry and wet irrigated crops.

7. *Agricultural practices* in the district follow still primitive and time-honoured methods. Scientific and up-to-date methods of cultivation have not made any headway yet. The great majority of ryots generally concentrate on the cultivation of dry crops on unirrigated lands, and content themselves with the minimum both of expense and of effort. They look to timely rains for successfully maturing such crops. If a favourable monsoon early in the season gives promise of a satisfactory crop, the ryots do some weeding; otherwise they leave the crops entirely to their fate except keeping a general watch over the fields. If the monsoon is favourable the crops, especially commercial crops like cotton and groundnut, yield good profits, at times disproportionately in excess of the trouble taken over them by the ryots. But not infrequently the monsoon fails miserably as the rainfall is uncertain

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and inadequate here. In black soil tracts crops like cotton and jonna which require little rain, provided it is timely, yield maximum results for the minimum of trouble on the part of ryots. The manure used for dry lands is nothing but the sweepings and cattle droppings which is collected and stored through the year. The ryots in the tracts in question are however not unaccustomed to the cultivation of wet or irrigated dry crops. In the majority of the villages commanded by the project there are tanks or spring and river channels. The supplies available in these sources are both precarious and inadequate and the ryots are accustomed to making the best use of them. In fact, in such villages, whenever there is any chance of water becoming available, the ryots never fail to take full advantage of it and raise irrigated crops. They put forth daily an enormous amount of physical labour for tapping river springs, clearing channels and carrying the water over long distances for the purpose of irrigating even small ayacuts. In other cases, wells are excavated often to great depths, for the purpose of supplementing the precarious supplies in the tanks and heavy expenditure of money and labour is incurred in baling water to crops on small extents. All this indicates that ryots in the district are quite alive to the advantages of irrigated over unirrigated cultivation. Even in respect of wet cultivation, the methods of agriculture are of the old orthodox kind. No prepared or artificial manure is applied. Cattle refuse is the general rule. Green leaf manure is used in parts where available. But it is scarce. Along with the introduction of the project, it will be necessary to undertake both demonstration and propaganda for popularizing the raising of manure crops on patta lands, the growth of trees for leaf manure and the use of artificial manures.

8. *Labour supply, population and manure.*—There is no dearth of labour or manure felt at present to meet the needs of dry lands and of wet lands under the present irrigation sources. The population is fairly adequate in the district. It is expected that in the initial years of the project irrigation the existing labour supply will be found sufficient and this supply is bound to grow with the more prosperous economic conditions which the completion of the project will bring into existence.

9. *General probability of the cultivators taking full advantage of water-supply.*—From what has been stated already, it is clear that ryots will be quite ready to take advantage of the water that will be made available. They have expressed their eagerness to take the project supply and pressed for the early execution of the scheme. But the change from unirrigated to irrigated cultivation will involve considerable capital expenditure initially in rendering the lands fit for the change and some years must elapse before all the water that the project may be able to supply comes to be fully utilized. It has also to be noted that the profits derived in recent years from commercial crops such as groundnut may not induce the ryots to give up such cultivation in favour of irrigation crops, not all at once, in any case. But even after making due allowance for these factors there can be no doubt that the area estimated above as likely to take water will be fully irrigated within a space of 15 to 20 years.

10. *Reasonable rates of water-cess.*—Enquiries of a general character have been made in all the taluks affected by the project and they have elicited the fact that ryots are prepared for an appreciable enhancement in the present rates for water in view of the assured supply they would get from the project. The minimum rate wanted by ryots according to the tahsildars is Rs. 5 per acre and the maximum Rs. 12 (the latter has been reported for Dharmavaram

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only). Variations between the maximum and the minimum have reference in some cases to the nature of the soil. The existing tanks and river channels are almost entirely precarious and ryots spend considerably more per acre on the irrigation of lands under wells and river channels than the rate I advise below. When they are relieved of all this heavy expenditure and strain they would gladly pay a considerably higher rate than the present rate of Rs. 4 under the so-called first-class sources and Rs. 3 under the rest. As far as I am able to gauge the public opinion of those who will take advantage of the project water, a water-rate of Rs. 7 per acre for a wet crop could, in case the capital expenditure on the project and its maintenance charges require it, be levied for an assured supply and without evoking much discontent. I also think that the ryots concerned could be persuaded to agree even to a slightly higher rate if it could be brought home to them on reasonable grounds that the project would otherwise have to be dropped.



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Sub-Enclosure.

(Revised) Statement showing the area available and fit for cultivation and other particulars in the villages affected by the modified scheme Tungabhadra Project in Anantapur district.

Number and name of the taluk.	Total number of villages.					Area available and fit for cultivation.			Probable extent likely to be irrigated including the present irrigated lands.	The area of likely second crop irrigation.
	According to the original irrigation project.	According to the modified project.				Present extent of lands.				
		(2)	(3)	(4)	(5)	Total.				
						Wet.	Dry.	Total.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Gooty ..	70	28	39	67	ACS. 5,706	ACS. 257,828	ACS. 263,534	ACS. 270,084	ACS. 54,000	ACS. 9,000
2. Tadpatri ..	27	14	16	30	5,084	86,137	91,221	93,505	19,000	3,200
3. Anantapur ..	..	52	29	81	12,801	149,444	162,245	227,646	390,000	7,300
4. Dharmavaram	20	18	38	11,552	89,499	101,051	184,745	285,800	6,000
Total ..	97	114	102	216	35,143	582,908	618,051	775,980	748,800	25,500

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(7)

From E. BENNETT, Esq., I.C.S., Collector of Bellary, Reference No.
C. 1002/29-B-4, dated 10th July 1929.

[Irrigation—Tungabhadra Project—Preliminary revenue
investigation—Report.]

I forward herewith a statement showing the area likely to be commanded by the proposed Tungabhadra Project in this district. The area shown in column (3) of the statement excludes uncultivated land, roads, cart-tracks, water-courses, village-sites and other communal grounds, etc. Column (4) shows the present extent of wet and dry lands comprised in the area shown in column (3). The area under heavy black cotton soil in each of the taluks affected by the project is shown in column (5) of the statement. The areas shown in this statement roughly cover the colour washing shown by the Executive Engineer and are only approximate. The commandable area according to the map furnished by the Executive Engineer, Tungabhadra Project division, is almost the same as that delineated in the map under the original Tungabhadra Project with the addition of a small tract of country in Hospet and Hadagalli taluks. The modified project benefits seven out of nine taluks of the district. The Siruguppa taluk which has been recently formed has not been shown separately in the statement referred to in paragraph 1 above as information in respect of villages now forming the new taluk has been included in the taluks of Bellary, Adoni and Alur.

3. *The present agricultural practices in the tract.*—The area commanded by the project is all dry land interspersed here and there with patches of wet cultivation under tanks, springs, channels and wells. As shown in column (4) of the statement enclosed, the extent under wet cultivation is less than 1 per cent in all the affected taluks except Hospet and Rayadrug where it is above 5 per cent. The people are accustomed to methods of dry cultivation only which involves comparatively less labour and expense. White cholam and korra in black cotton soils and yellow cholam, korra and cereals are the main crops raised in these dry lands. Paddy, sugarcane and plantains are the crops raised in the wet lands commanded by Tungabhadra and other channels and tanks. Industrial crops, viz., cotton and groundnut, yield a fair outturn in dry tracts and are among chief dry crops grown now. The advent of facilities for irrigation will, in the natural course of things, bring a change in the methods of cultivation and the people when they become accustomed to wet cultivation will not be slow to adopt the new methods.

4. *Availability of manure.*—The area under the heavy black cotton soil in the tract forms about 52 per cent of the commandable area. In Hadagalli taluk it is mostly red soil. In the case of lands other than black loam or clay, sowings commence early in May with the first outbreak of the south-west monsoon and end by September. The cultivation in the black cotton soils generally commences in July and ends by November. Cattle manure is the only kind which is much in use in the dry tract and the extent of manuring in the dry lands depends on the capacity of the ryot, the distance of the field and the nature of the crop grown. This kind of manure being available in limited quantities only the fields are not manured annually but in rotation. Leaf manure is available only in one taluk, i.e., Rayadrug. The country for the most part is not well provided with forest to ensure a constant and sufficient supply of green manure. The demand for leaf manure will be

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increasingly felt with the progress of wet cultivation and the ryots will then be forced to take to growing manure crops such as sunnhemp, etc., as is at present done in the wet areas under Tungabhadra channels.

5. *Labour supply and population.*—The population of the area commandable by the project is noted in column (6) of the statement enclosed. The incidence of population for the commandable area is about one person for every three acres. I do not think that there will be much dearth of labour during the first few years after the opening of the project but the supply is bound to grow deficient as larger tracts are brought under cultivation in course of time.

6. *General probability of cultivators taking full advantage of the water.*—As cultivation of dry crops predominates and these crops do not require as much labour and expense as wet crops it is not likely that the ryots will directly take to cultivation of all kinds of wet crop. It is also doubtful if the owners of black cotton soil lands will take full advantage of the irrigation facilities owing to the general idea prevalent in them that black cotton soil is unsuited for irrigation, but in tracts where paddy cultivation has been introduced, the ryots are eager to extend their wet cultivation. Anyhow it will take some time for the ryots to take full advantage of the scheme. The probable demand for irrigation of second crop may be estimated at one-third of the proposed wet extent.

A reasonable rate of water-cess taking into consideration the fact that the project is costly.—The maximum rate of assessment under the existing Tungabhadra channels in the district is Rs. 13 (rupees thirteen) per acre. The lowest wet rate under the channels is Rs. 4-12-0 per acre. The average of the two above rates comes to Rs. 9 an acre under river channels. The highest dry rate in the district is Rs. 2-13-0 per acre. This is for III-2 soil which is not so suitable for irrigation as IV-1, the rate for which is Rs. 2-4-0 and the water-cess chargeable for a wet crop under a first-class irrigation source in addition to the dry assessment is Rs. 4 per acre or Rs. 6-13-0 in all. As the project is to open up vast extents of dry tracts for irrigation the present high economic value of an acre of wet land is bound to go down as irrigation advances. The levy of graduated water-rates appears to be unsuitable. As is being done in the case of Mettur a fixed water-rate to be charged in addition to the dry assessment seems desirable. The lands under the project will be just as well off as those under the present Tungabhadra channels; so I think this rate should be fixed to make the total charges correspond. A water-rate of Rs. 10 would bring the charge on IV-1 soil to Rs. 12-4-0 which would, I think, be fair. This rate would press rather more hardly on the worse lands but is not, I think, excessive even for them.

General.—As the approximate cost of the scheme is not known it is not possible to state definitely what return it would fetch. The scheme is most desirable as it would be an assurance against famine.

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only). Variations between the maximum and the minimum have reference in some cases to the nature of the soil. The existing tanks and river channels are almost entirely precarious and ryots spend considerably more per acre on the irrigation of lands under wells and river channels than the rate I advise below. When they are relieved of all this heavy expenditure and strain they would gladly pay a considerably higher rate than the present rate of Rs. 4 under the so-called first-class sources and Rs. 3 under the rest. As far as I am able to gauge the public opinion of those who will take advantage of the project water, a water-rate of Rs. 7 per acre for a wet crop could, in case the capital expenditure on the project and its maintenance charges require it, be levied for an assured supply and without evoking much discontent. I also think that the ryots concerned could be persuaded to agree even to a slightly higher rate if it could be brought home to them on reasonable grounds that the project would otherwise have to be dropped.



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(8)

Letter from R. D. ANSTEAD, Esq., C.I.E., M.A., Director of Agriculture,
Madras, dated 3rd July 1929, No. R. Dis. D-381/28.

[Irrigation—Tungabhadra Project—Preliminary investigation.]

I have had an examination made, as far as is possible without maps of the areas it is proposed to bring under irrigation, as to the suitability of the soils for irrigated cultivation in the areas mentioned in the Board's Reference above and I have the honour to enclose herewith a report on the same.

2. In this connexion I would once more emphasize the opinion of the Agricultural Department that what is desirable is to make a protected area for the dry red lands and to convert the black soils into garden lands with a minimum of paddy wet land. I am quite aware that this policy is more costly and will bring in less revenue than one of converting all soils into wet paddy lands but at the same time it is agriculturally sound as I have had the honour to point out on previous occasions.

3. The conversion of black soils into wet lands should particularly be avoided. Under such a system it is impossible to grow either green manure or fodder crops on them. On the other hand if such soils are placed under an irrigation scheme by which they can be converted into garden lands many existing difficulties could be overcome. A range of crops could be grown, fodder could be raised for the cattle, and the manurial question could be solved. In a word it would be really sound farming.

4. The accompanying report should be read in the light of these remarks. It merely gives as far as possible what was asked for, an opinion on the suitability of the soils for irrigation but expresses no opinion as to the kind of irrigation which is the most advisable.

Sub-Enclosure.

Report on the suitability of the soil in the tract proposed to be irrigated by the Tungabhadra Project.

The limiting factor in the food production in the Ceded districts is the availability of water and not the suitability of the soil. Most of the soils in the area will respond to wet cultivation readily and gradually. If there is any decrease in the area under irrigation in recent years it is mainly due to want of sufficient supply of water but not to unsuitability of soil. Irrigated crops are raised at present in almost all kinds of soils and instances are rare where wet cultivation has been given up owing to unsuitability of soils. So if irrigation facilities are provided there is every chance of utilizing the water to the fullest extent.

(1) *Bellary district*—Areas in *Hadagalli, Hospet and Rayadrug taluks*.—Different kinds of soils met with in the above taluks will easily admit of irrigated cultivation. The suitability of black regada soil for wet cultivation may give rise to doubt, but the experiments conducted at Hagari farm, have proved that they are quite fit.

(2) and (3) *Anantapur district*—Areas in *Gooty, Anantapur and Dharmavaram taluks* and area irrigable by the proposed *Upper Pennar* in *Tadpatri taluk*.—Generally the soil of the Anantapur district is the poorest in

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the Ceded districts and alkaline patches are met with in different places. But the soils will respond to wet cultivation provided they are adequately drained.

(4) *Cuddapah and Kurnool districts—Areas irrigable by the widened Kurnool-Cuddapah canal and the Velgode Project.*—At present canal water is utilized for wet crops on all classes of soils to a certain extent. It is a fact that the canal water has not been fully utilized by the ryots. This is not due to the unsuitability of the soil but to the following reasons: (i) the conversion of dry into wet land will naturally be a gradual process, depending much on the economic condition and the holding of the ryot. For instance a ryot having about 20 acres of dry land will not be able to convert all the 20 acres into wet land, for want of sufficient capital and insufficient labour and manure. Hence the process must be a gradual one. (ii) A large portion of the land along the course of the canal is cropped with industrial crops such as groundnut and cotton, which give them fair returns with least cost of cultivation.

In the Cuddapah taluk which is at the tail end of the canal and which does not get sufficient quantity of water, ryots would utilize water to a greater extent by bringing in fresh areas under wet cultivation. If the water-supply is increased and assured by widening the present canal the prospect of a second crop in all the taluks covered by the canal will be bettered.

Velgode project.—In the Cuddapah district it is expected to benefit the Badvel and Siddhout taluks. At present the irrigated crops in the above taluks are mainly tank-fed. In recent years the tanks failed to get a good supply and as a result there is a great clamour for water-supply in these two taluks.

If water is supplied by this project, there will be a great response from the ryots to avail of the supply and further the soils are quite suited for wet cultivation.

(5) *Areas irrigable by the Owk project and canal from the Kunderu via Nossam to Jammalamadugu.*—There are two points to be considered regarding the project: (i) the quality of the water of the Kunderu canal and (ii) the nature of the soil of the Jammalamadugu taluk proposed to be irrigated.

Generally the ryots are of opinion that the water contains harmful salts, as it happens to be the main drainage source of the great black soil belt of Cuddapah and Kurnool districts. So there is a general aversion on the part of the ryots for the use of this water for irrigation purposes.

Ryots at present are making decent profits by raising dry crops, such as groundnut, jonna and cotton. If there are three good rains at an interval of one month after sowings, the outturn happens to be good.

Apart from the suitability of the soil, it is very doubtful whether the ryots would respond to the availability of water to grow irrigated crops.

(6) *Area irrigable by a diversion dam across the Kistna at Pulichantala and canal system in the Guntur district.*—The area consists of typical black soil and is for the most part of the same kind and quality as the areas which have already been brought under irrigation. Good red soils are also met with in the immediate neighbourhood of hills. Some saline areas appear near the coast. The whole area is well suited to bear irrigated crops and may even prove more productive than the existing delta. Moreover, as these lands are undulating, there is scope for varied cropping in addition to paddy which would of course form the main bulk.

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The conversion of such a large area into wet in the higher reaches is likely to have an adverse influence on the paddy lands in the present delta area lower down, as a very large volume of water will have to drain itself through it in addition to the volume of its present drainage which has not been satisfactorily disposed of even now. This aspect of the question should receive special attention and in a scheme of such magnitude it is essential that the drainage is properly provided for. It is also a question to be considered whether it is really an advantage from an agricultural point of view to convert into wet the rich black soil areas which have been producing food crops and profitable economic crops of high commercial value and where famine is almost unknown.

(7) *Kistna delta extensions*.—This consists of (1) bringing under irrigation a new area of 125,000 acres during the normal seasons June to December and (2) supplying water to an area averaging 167,000 acres between the months of February and May of which 142,000 acres will bear a second crop and 25,000 acres will come under a 'short late crop'. The former would have borne a first crop in the normal season June to December while the latter area could not bear any crop in the early season being subject to inundation.

The area where cultivation is proposed to be extended in the normal season comprises mostly patches of land of varying sizes adjoining lands which are already under irrigation except the Challapalli and Kona blocks comprising an area of 72,409 acres where the soil is mostly black soil with a belt of alluvial soil bordering the Kistna. Good dry crops like jonna, maize, chillies, coriander and tobacco are being raised in this area. It is quite suitable for paddy cultivation. Most of the other blocks are at the tail-end of canals. They are low-lying and consist of sandy and regada soils more or less saline. Extension of irrigation with a view to bring them under paddy cultivation is the only rational way of treating these lands. These are mostly surrounded by wet cultivation and the denial hitherto of irrigation water to them has resulted in their getting saline and bearing indifferent dry crops as they are surrounded by water all round. Under the circumstances, paddy is the only crop which they could be expected to grow with some profit and their conversion to wet land was only prevented till now by the uncertainty of irrigation water being available in the canals in the months of November and December. The proposed reservoir will guarantee necessary supply during this period in future. As already stated these areas are low-lying and require their drainage facilities to be improved.